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AN EMPIRICAL INVESTIGATION ON THE PERFORMANCE OF THE COMPONENTS OF QUALITY MANAGEMENT: IN THE CASE OF ETHIOPIAN MANUFACTURING COMPANIES

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A B S T R A C T

The main issue that requires careful consideration if organizations want to surpass their competition is quality management. The ability to create high-quality goods that meet or exceed customer expectations is critical to the survival and profitability of any government or private manufacturing enterprise. The purpose of this article is to examine the performance of the quality management components in Ethiopian manufacturing firms. Based on the literature reviewed four crucial quality management components were identified (i.e. quality planning, quality control, quality assurance, and quality improvement). As a result, the variables were used to create the conceptual framework and survey questions. Descriptive statistical analysis was used to analyze the data. The results indicate that the performance of quality management components in selected manufacturing companies was found to be low throughout all tents, including quality planning, quality control, quality assurance, and quality improvement.

1. INTRODUCTION

Currently, quality management is the standout factor that needs careful consideration if businesses are to outperform their competitors. In any government and private manufacturing firm, the key to its survival and success depends on the capacity to provide high-quality products and meet or exceed customer expectations. It is a common phenomenon that many manufacturing companies encounter issues in delivering satisfactory products to its customer at the minimum manufacturing cost that will increase the profits and reputation of the company.

Meanwhile, in today's competitive business environment, manufacturing firms are under pressure to match particular client demands while still delivering high-quality items to the market. Moreover, it is reasonable by most of the partners that quality management issues are the bumbling piece for the investors in manufacturing companies. Besides, quality management issues were clear in all divisions. As a result, many companies have reacted to the issues by adopting broad aspects of quality and they are beginning to emphasize quality management in all elements and phases of their business rather than just operations. Quality management, despite its prominence, has been the subject of countless empirical studies, for example, see, Agarwal et al. (2013), Bayissa (2016), Berhe and Gidey (2016), Bhatia and Awasthi (2017), Birhanu and Daniel (2014), Brkić et al. (2011), Buhumaid (2022), Claver et al. (2003), Gedif (2019), Gutiérrez et al. (2012), Hoonakker et al. (2010), Jaafreh and Al-

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abedallat (2013), Kitaw & Bete (2003), Lakhal et al. (2006), Martínez-Costa and Martínez-Lorente (2008), Milanoi (2016), Mohammed et al. (2019), Muyanda et al. (2019), Naing et al. (2006), Patyal and Koilakuntla (2017), Phan et al. (2011), Tarí et al. (2007), Zeng et al. (2014), Wanza et al. (2017). Generally, most of the empirical studies focus mainly on discussing quality management practices, and principles, and examining their impact on organizational performance in various sectors. Even if, there are numerous empirical studies conducted on quality management. Still, there is an absence of empirical studies on ascertaining the performance of the quality management components. Consequently, this article critically examines the performance of the quality management components in Ethiopian manufacturing firms. This article is organized in chronological order as follows. Section two presents a related literature review of the concept, theory, definition, models, and findings on components of quality management. Section three describes the methodologies employed in the research. Section four presents the results of the research investigation and demonstrates how different manufacturing firms implement crucial quality management components. Section five interprets the analysis result. Section six shows a conclusion drawn from the research and forwards a method of how the company can overcome issues related to quality management components.

2. LITERATURE REVIEW

2.1 Concepts of Quality and Quality Management

Regardless of the challenges in defining the concept of quality exactly, however, several scholars have defined the concept of quality from different perspectives (Saghier & Nathan, 2013). Meanwhile, Harvey and Green (1993) summarize the concept of quality into two different comparative concepts such as quality means different things to different people, and the second is relative to a process or outcomes, subsequently, they reflected quality as an exception, value for money, transformative, and fitness for purpose. Also, based on their importance, the concept of quality can be categorized into five generic classes in terms of, transcendent, product, process or supply, customer, and values approach (Ghobadian et al., 1994). The concept of quality leads to meeting the gap between what customers expect and what they perceive (Shen et al., 2000). Indeed, the concept of quality is quite difficult for customers to understand, consequently, customers describe quality based on their actual perception (Dale, 2003). See, for example, the meaning of quality in Figure 1.

In brief, this means when we discuss anything using the concept of quality, it simply implies that we are referring to the extent or degree to which the stated requirement is met. The concept of quality management has evolved over the last decade, from a nascent set of concepts to a comprehensive framework for controlling all aspects of quality in any organization.

Quality management includes guiding and managing aspects such as staff training, supplier quality management, and product or service design; also, from a system–structural perspective, quality management may be described as a simple three-stage process mode (Benson et al., 1991). See, for instance, Figure 2.

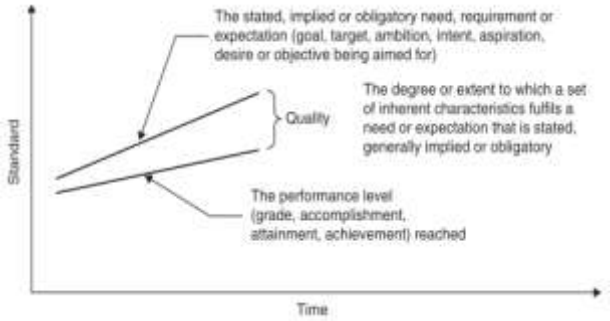

Figure 1. The meaning of quality.
Source: (Hoyle, 2007)

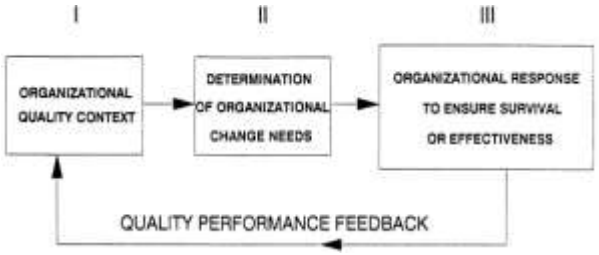

Figure 2. System–structural view of quality management. **Source:** (Benson et al., 1991)

Quality management is defined as an integrated strategy for achieving and maintaining high-quality output by focusing on the maintenance and continual improvement of processes and defect avoidance at all levels and in all activities of an organization to meet or exceed customer expectations (Flynn et al., 1994). Quality management is described as a management philosophy or strategy comprised of a collection of mutually reinforcing principles, each of which is backed by a set of practices and methodologies (Sousa & Voss, 2002, p. 92). Modern statistical quality control, quality improvement, and reliability operate within the concept of quality management (Bisgaard, 2007, 2008). Finally, ISO 9000 describes quality management as a coordinated action that directs and controls an organization's quality (Hoyle, 2007). Quality planning, quality control, quality improvement, and quality assurance are examples of these activities.

2.2. Components of Quality Management

To date, a great deal of studies has been done from many angles to identify the components of successful quality management, with contributions from quality leaders, formal assessment models, and empirical studies as crucial sources (Tarı, 2005). It was required

to identify each critical quality management component in detail for this research. Numerous scholars stated the pillars of quality management consist of quality planning, quality assurance, quality control, and quality improvement. See, for example, Table 1.

Therefore in this section, the critical quality management components are identified. Accordingly, the variables will be used to create the conceptual framework and survey questionnaires, as well as to look into the possibility of using these components in specific manufacturing companies.

Table 1. Component of quality management

	Variables	References
Components of Quality Management	Quality planning Quality control Quality assurance Quality improvement	Bisgaard (2007), Bisgaard (2008), Hoyle (2007); Mitra (2016), Tummala and Tang (1996), Visschedijk et al. (2005); Westgard and Westgard, (2016)

Conceptual Framework is shown in figure 3.

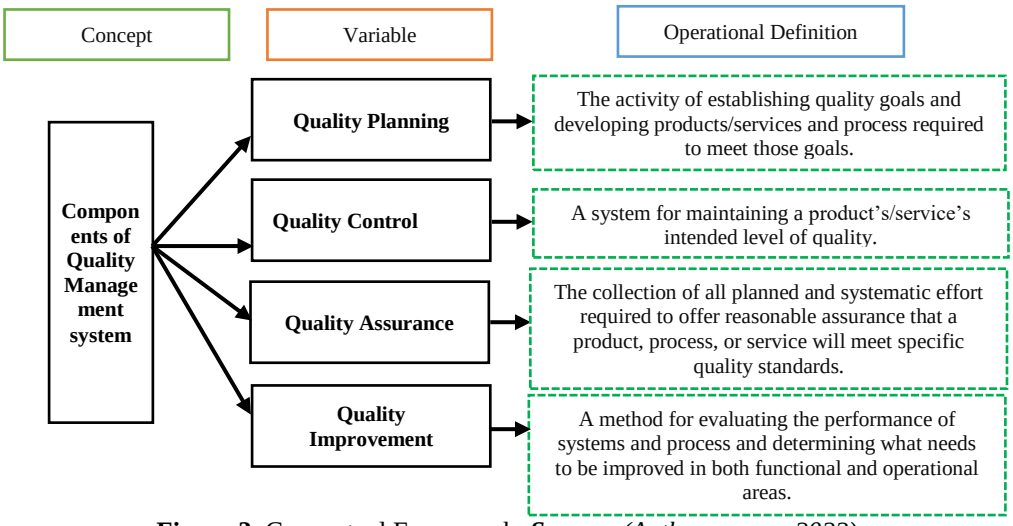

Figure 3. Conceptual Framework**.** ***Source:*** *(Author survey, 2022)*

2.3 Empirical Studies

In the previous section theories, regarding quality and quality management have been explained in detail. Further, a critical quality management component was identified. With this in mind, the conceptual framework is created using these identified variables. Therefore in this section, empirical studies will be reviewed in each quality management component in detail.

2.3.1. Quality Planning

Several researchers have conducted empirical research over the last decade to explore the impacts of quality planning on different sectors. See, for example, Table 2.

2.3.2. Quality Control

Similarly, numerous scholars have undertaken empirical studies to investigate the effects of quality control in various industries. See, for case, Table 3.

2.3.3. Quality Assurance

This section presents empirical studies on quality assurance from various sources. See, for instance, Table 4.

2.3.4. Quality Improvement

This section presents empirical quality improvement research from a variety of sources. See, for case, Table 5.

Table 2. Empirical studies on quality planning

Author	Research Purpose	Methods	Units of Analysis	Findings
(Lam, 1997)	Investigate the quality planning process &its perceived usefulness.	Factor & Cluster analysis	84 quality managers	Different firms could be grouped according to their strategic planning orientation & the level of planning sophistication was found to moderate significantly the strategic performance baseline.
(Senaratne & Thushangi, 2012)	Explore whether the Sri Lankan construction contractor practices quality planning effectively and the extent to which they are ready to implement strategic quality planning.	Descriptive & Inferential Statistics Analysis	3 large-scale constracting firms	ISO 9000 is the most quality management practiced by Sir Lankan construction contractors.

Table 3. Empirical studies on quality control

Author	Research Purpose	Methods	Units of Analysis	Findings
(Olayiwola et al., 2019)	Investigate the effect of quality control management and customer retention focusing on the dimensions of employee participation, supplier quality management, higher management commitment, and leadership enhancement in quality.	Pearson Product Moment Correlation & Multiple regression Analysis	150 respondent	+ve significant relationship between high management commitment (r = .659), supplier quality management (r = .607), employee involvement (r = .619), leadership enhancement (r = .508) and customer retention.
(Oloo, 2017)	Investigate based on two theories, Deming's theory of total quality management and the reliability theory by Rausand and Hoyland.	Descriptive Statistics & Regression Analysis	5 mobile telecommunication firms	72% of the variation in organizational performance can be accounted for by the variation in the quality control practices discussed, with the remaining 28 % being accounted for by other factors not in the model or by chance variation.
(Alzoubi, 2021)	Investigate the hotel industry in the light of process quality and quality control.	Descriptive statistics, correlation, ANOVA & regression analysis	119 hotel firms	Process quality & quality control has a significant impact on attaining competitiveness in the hotel industry.

Table 4. Empirical studies on quality assurance

Author	Research Purpose	Methods	Units of Analysis	Findings
(Belina, 2021)	Investigate the extent of quality assurance implementation from the inspection approach & its contribution to quality enhancement & accountability.	Thematic analysis	2 firms	The inspection strategy design at MOE did not practically implement as it was designed & it has a shortage of linkage to the operational practice.
(Sultana et al., 2020)	Empirically investigate the SQA process followed in software companies in Bangladesh.	Quantitative & Qualitative analysis	9 software companies	More than half of the companies fall short in adhering to SQA practices within their SDLC. The rest either fully or partially comply with it.
(Faller, 2018)	Analyze the impact of quality assurance on management practices & staff performance in the technical college of the Sultanah of Oman.	Descriptive-correlation analysis	233 faculty member	The relationship between all the quality assurance implementation and staff performance, implementation & management practices was significant.
(Sowunmi et al., 2016)	Investigate the software quality assurance practices of practitioners in Nigeria	Descriptive statistics	All software firms in Nigeria	It was observed that quality assurance practices are quite neglected and this can be the cause of low patronage.

Table 5. Empirical studies on quality improvement

Author	Research Purpose	Methods	Units of Analysis	Findings
(Maani et al., 1994)	Empirical verification of the operational & strategic value of quality improvement aims to narrow the gap between theory & practice.	Structural Equation Modeling (SEM)	184 plant	Improving quality positively enhances operational performance & productivity.
(Miller et al., 2006)	Investigate quality improvement practices of for-profit & not-for-profit hospitals.	Factor analysis	110 hospitals	Thus, underscoring the utility of quality improvement efforts despite the difference in operating characteristics, strategies & operating constraints is helpful.
(Kokemüller, 2011)	Empirically analyzing the factor influencing the success of data quality improvement.	Structural Equation Modeling (SEM)	179 respondents	Organizational implementation success is positively associated with perceived data quality, whereas no significant contribution of data quality project, to perceived data quality, could be observed.
(Mulay &	Investigate the impact of quality	Partial Least	725	The admissions process was found to have the most

Khanna, 2020)	(in terms of customer expectations) related to selected administrative processes in professional higher education institutions.	Square-Structural Equation Modeling	respondents	impact on quality, and exam & placement processes also had a significant impact on quality.

3. METHODS

With the research objective in mind, the quantitative research method was used in this research. Descriptive statistical analysis was used to examine the performance of the quality management components in Ethiopian manufacturing firms. Meanwhile, in this research, data were collected online from the respondent using close-ended survey questionnaires. Simple random sampling was selected.385 number of the case company's general manager, head of department/section, QMS coordinators, and quality teams are involved. The case company's employees, who were field workers (like purchasers, and sellers) and those who are newly employed and had inadequate knowledge/information for the quality management implementation were excluded.

Reliability Statistics

In reliability statistics, there are so many methods suggested by various literature. Among them, the most preferred method is the internal consistency method which includes (split-half, item-total correlation, and Cronbach's-alpha/coefficient alpha). Among these, the most frequently used method is Cronbach's-alpha/coefficient alpha. Even though Cronbach's-alpha/coefficient alpha is translated in numerous ways in the literature, the most common interpretation is described in Table 6.

Table 6. The Classification of Cronbach's Alpha Coefficient.

Cronbach's Alpha Coefficient	Interpretation of Cronbach's Alpha Coefficient
≥ 0.9	The internal consistency of the scale is high
0.7 ≤ α < 0.9	The scale has internal consistency
0.6 ≤ α < 0.7	The internal consistency of the scale is acceptable
0.5 ≤ α < 0.6	The internal consistency of the scale is weak
α ≤ 0.5	The scale has no internal consistency

Source: *(Sürücü & Maslakçi, 2020)*

Briefly, in this research, Cronbach's-alpha/coefficient alpha was utilized to check the internal consistency of the data. The main aim of conducting reliability statistics analysis (Cronbach's-alpha/coefficient alpha) is to identify the internal consistency of the data. Therefore, Table 7 indicates that the Cronbach's-alpha/coefficient alpha value of each construct falls between $0.7 \leq \alpha < 0.9$ which shows that the scale has internal consistency.

Table 7. Reliability statistics for Cronbach's alpha

No.	Construct	Item	Cronbach's-alpha (α)	N
1	Quality Planning	QP_1	0.856	120
		QP_2		
		QP_3		
		QP_4		
		QP_5		
		QP_6		
2	Quality Control	QC_1	0.869	120
		QC_2		
		QC_3		
		QC_4		
		QC_5		
		QC_6		
3	Quality Assurance	QA_1	0.726	120
		QA_2		
		QA_3		
		QA_4		
		QA_5		
4	Quality Improvement	QI_1	0.786	120
		QI_2		
		QI_3		
		QI_4		
		QI_5		
		QI_6		

Source: *(Author survey,2022)*

Validity statistics

The Kaiser-Meyer-Olkin (KMO) test is used in this research to determine the sampling adequacy of data that will be used for exploratory factor analysis. The KMO test also allows us to ensure that the data we have are suitable for running an exploratory analysis and it also determines whether or not we have specified what we intend to measure. Furthermore, a KMO score between 0.8 and 1 shows that the sample is appropriate if the KMO value is less than 0.6 the sampling is insufficient for analysis. Therefore, the table below shows that the KMO test value is 0.892 which is between 0.8 and 1 indicating that the sampling is appropriate for further exploratory factor analysis.

Furthermore, the usefulness of exploratory component analysis was verified by Bartlett's test of Sphericity, which is employed as a measure of the strength of the link between variables. The score of Bartlett's Test of Sphericity (Chi-Square) is 1,848.058, suggesting that the data were suitable to proceed with the exploratory component analysis.

Table 8. KMO and Bartlett's test.

KMO & Bartlett's Test			
Kaiser-Meyer-Olkin measure of sampling adequacy			0.892
Bartlett's Test of sphericity	Approxi square	Chi-	1848.058
	df.		0.231
	Sig.		0.000

Source: *(Author survey, 2022)*

Table 9. Total variances explained.

Total Variance Explained						
Components	**Initial Eigen Values**			**Rotations sums of squared loadings**		
	Total	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	10.236	46.527	46.527	9.965	45.297	45.297
2	3.047	13.851	60.377	2.585	11.749	57.047
3	2.449	11.133	71.510	2.296	10.438	67.485
4	1.804	8.200	79.710	2.152	9.784	77.269

Source: *(Author survey, 2022)*

Note: Extraction Method: Principal Component Analysis

The primary objective of doing exploratory factor analysis is to identify the important factors or dimensions of competing priorities. To assess the number of components to keep for quality management, the researcher applied the notion of Kaiser's rule (Eigenvalue >1), but with a more interpretable factor loading. Similarly, the leftmost section of the preceding table represents the variation explained by the first solution; only four components in the initial solution have Eigenvalue >1, and the entire cumulative percentage weights 77.269 percent of the variability in the original variables. This suggests that four hidden influences are linked to quality management. However, the reaming components are unexplained variances since their Eigenvalue is less than one. Likewise, the rightmost half of the preceding table represents the variation explained by the extraction factor after rotation.

The rotation factor model makes minor modifications to all four components. Following the completion of the aforementioned stage, which is the KMO and Bartlett's Test of Sphericity, the researcher conducted exploratory factor analysis utilizing the principal component extraction method with quartimax rotation and Kaiser Normalization. Kaiser normalization is used to provide solution stability across samples; in this analysis, all elements have equal weight while rotating. Similarly, quartimax is used for orthogonal rotation because it finds overall factors as well as optimizes squared loading such that each item loads most strongly onto a single factor. Similarly, orthogonal rotation analysis presupposes that all factors are independent or unrelated to one another.

Table 10. Exploratory factor analysis of components quality management.

Rotated component matrix				
Construct	**Components**			
	1	**2**	**3**	**4**
QP_1	0.929			
QP_2	0.912			
QP_3	0.757			
QP_4	0.840			
QP_5	0.795			
QP_6	0.856			
QC_1		0.516		
QC_2		0.762		
QC_3		0.750		
QC_4		0.900		
QC_5		0.779		
QC_6		0.850		
QA_1			0.964	
QA_2			0.473	
QA_3			0.667	
QA_4			0.979	
QA_5			0.642	
QI_1				0.903
QI_2				0.736
QI_3				0.689
QI_4				0.855
QI_5				0.883
QI_6				0.502

Source: *(Author survey, 2022)*

Note: Extraction Method: principal component analysis
Rotation Method: Quartimax with Kaiser Normalization
Rotation coverage in 7 iterations

4. RESULTS AND DISCUSSION

This section presents the descriptive statistics analysis of the research investigation and demonstrates how different manufacturing firms implement crucial quality management components. Based on the descriptive statistics obtained, under quality planning, there are six sub-criteria. Among these companies, employees are given adequate time to plan for and test improvement (-0.942) and each department and workgroup within this company/division/team maintains specific goals to improve quality (-0.849) that is exceptionally skewed negatively (-0.942). Under quality control, there are six sub-criteria. All of them are skewed negatively. However, the quality and supervision organization is sited enough to ensure satisfactory quality control in the companies (-1.938), the company / division / department/ teams have adequate knowledge to challenge quality control results in the organizations (-1.673), and quality control is performed efficiently at the companies (-1.519) are significantly skewed negatively. Similarly, under quality assurance, there are five sub-criteria.

Table 11. Descriptive statistics.

Manufacturing industries			
Construct	Std. deviation	Skewness	Kurtosis
QP_1	1.2050	-0.942	-0.050
QP_2	0.8982	-0.849	0.182
QP_3	1.0241	-0.275	-1.038
QP_4	0.5021	0.000	-2.034
QP_5	0.8754	-0.514	-0.283
QP_6	0.2148	-0.756	-0.124
QC_1	0.9258	-1.938	2.643
QC_2	0.7515	-0.348	-1.151
QC_3	0.4602	-0.884	-1.240
QC_4	0.9204	-1.673	-1.953
QC_5	0.4920	-0.413	-1.860
QC_6	0.4017	-1.519	0.312
QA_1	0.8754	-1.321	1.450
QA_2	0.4602	-0.884	-1.240
QA_3	0.4602	-0.884	-1.240
QA_4	0.8096	-1.159	-0.454
QA_5	0.4602	-0.884	-1.240
QI_1	0.8341	-1.251	1.615
QI_2	0.9204	-1.673	1.953
QI_3	0.8341	-0.191	-1.540
QI_4	0.4920	-0.413	-1.860
QI_5	0.8754	-1.321	1.450
QI_6	0.4920	-0.413	-1860

Source: *(Author survey, 2022)*

The companies/divisions/departments/teams view quality assurance as continuing the search for ways to improve (-1.321), and the company has an independent quality assurance department within the company (-1.159) that is strongly skewed negatively. Finally, under quality improvement, there are six sub-criteria. All of them are skewed negatively. Nonetheless, the company/division/department/teams provide highly visible leadership in maintaining an environment that supports quality improvement (-1.251), and the company/division/department/teams allocate adequate organizational resources (e.g finance, people, time, and equipment) to improve quality (-1.673), and quality improvement only involves managers (-1.321) are significantly skewed negatively.

5. CONCLUSIONS

The present research contributes to the dearth of research on quality management components in emerging manufacturing companies, particularly in Ethiopia, whereas past research has solely, focused on the total quality management practices, however, this article has focused on exploring the crucial quality management components that are significant for the success of any manufacturing companies. And investigate the challenges of implementing crucial quality management components. Besides, for effective usage of quality management, participation, individual association, group soul, devotion, communication, and a qualified workforce are required. And normal preparation, best administration, worker engagement, arrangement, adequate asset assignment (individuals, machines, crude materials), and rectifying documentation are all vital. The outcome of the descriptive analysis support that the practicality of quality management components in selected manufacturing companies was found to be low throughout all tents, including quality planning, quality control, quality assurance, and quality improvement, according to an analysis of the quality management components self-assessment report evaluation.

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